REMARKS

Claims 1 – 3 and 5 - 22 are pending in this application. Claims 1 – 3, 5-14, 21 and 22 are allowed. Claims 15, 16 and 18-20 are rejected under 35 U.S.C. § 102(b). Claim 17 is objected to, but contains allowable subject matter. Claim 8 is amended. No new matter has been added. In view of the amendments and the following remarks, reconsideration and allowance of all pending claims are respectfully requested.

Allowable Subject Matter

The office action indicated that claim 17 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant thanks the Examiner for identifying allowable subject matter.

Claim 17 depends from independent claim 15, which is proposed to be allowable for the reasons stated further below. It is believed that claim 17 should be allowed for at least that reason.

The office action also states that claims 1-3, 5-14, and 21 – 22 are allowed. However, the office action further stated that claims 8 – 13 are rejected under 35 U.S.C. § 112, second paragraph as will be discussed further below.

Claim Rejections under 35 U.S.C. § 112

Claims 8 – 13 are rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, claim 8 is rejected for reciting "the first control

signal" without proper antecedent basis, and claims 9 – 13 are indefinite because of the infelicity in claim 8.

Claim 8 has been amended to clarify a minor infelicity in claim 8, and is now believed to be in proper form for allowance. Since claim 8 has been amended, claims 9 – 13 are also believed to be in proper form for allowance. It is respectfully submitted that the rejection of claims 8 – 13 under 35 U.S.C. § 112, second paragraph is overcome and notice to that effect is requested.

Claim Rejections under 35 U.S.C. § 102(b)

Claims 15 - 16 and 18 - 20 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,994,875 to Lee. According to the office action:

> "Figure 3 shows an apparatus comprising a first voltage drop (R22, R23) means that is coupled to a common node (left hand side of the resistor R21) and arranged to provide a trip point level at a tap point, wherein the first voltage drop means comprises a resistor means that comprises at least a first resistance means (R22) and a second resistance means (R23) that are coupled together at the tap point; and current source means (R24 provide a constant current according to Ohm's law I=V/R) that is arranged to coupled [sic] to a sense current (current pass through resistor R21) to the resistor means such that the trip point level is provided at the tap point in response to the sense current, a pass means (10) is coupled between an input source node and the common node, a sense means (r21) is coupled between the common node and an output node, comparator means (OP21) includes a first input (positive terminal) is coupled to the tap point, a second input (negative terminal) is coupled to the output node, wherein the comparison means is arranged to assert a trip point detection signal when the current decreases from a current limit level to a predetermined threshold level as called for in claims 15-16 and 18-20."

Claim 15 recites at least the following limitations that are not taught by any of the cited references:

> "a first voltage drop means that is coupled to a common node and arranged to provide a trip-point level at a tap-point, wherein the first voltage drop means comprises:

a resistor means that comprises at least a first resistance means and a second resistance means that are coupled together at the tap point; and

a current source means that is arranged to couple a sense current to the resistor means such that the trip point level is provided at the tap point in response to the sense current".

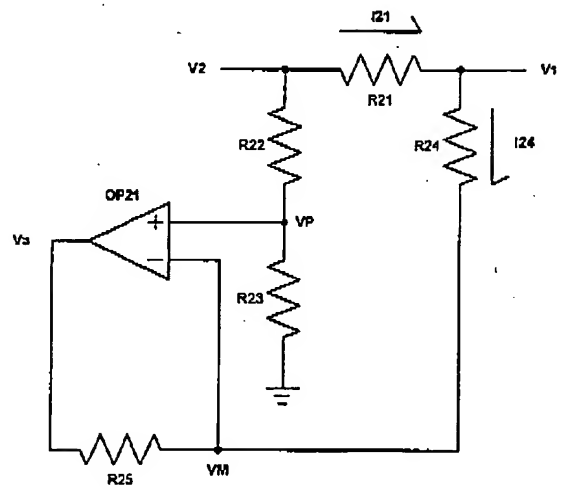
As described previously above, the Office Action states that resistor R24 provides a constant current according to Ohm's law, where I = V/R, in the same manner as Applicant's claim 15. Moreover, the office action states that sense current that is provided through resistor R21 is coupled to the resistor means such that the trip point level that is provided at the tap point changes. Both of these conclusions are false as will be discussed below.

Resistor R24 does not provide a constant current. In order for resistor R24 to provide a constant current (e.g., I24) and still satisfy Ohm's law, the voltage drop (e.g., V24) across resistor R24 would also have to be constant. In other words, I24 = V24/R24. However, the voltage drop across resistor R24 is not constant for a number of reasons as will be described below. Moreover, the current that is flowing through resistor R24 does not effect the voltage at the tap point between resistors R22 and R23, and thus does not effect the trip point voltage as described in Applicant's claim 15.

Resistor R22 and resistor R23 form a voltage divider circuit that is provides an input voltage to the non-inverting input of amplifier OP21 (See *Lee* col. 7, lines 29 – 32). As such, resistors R22 and R23 are coupled in series to one another between the output of the switching regulator (10) and a circuit ground (see FIG. 3 of *Lee*). According to *Lee*, the DC output voltage is applied to the resistor divider (see col. 7, lines 31 – 33). Assuming arguendo that the junction of resistors R22 and R23 correspond to a tap-point, the voltage at this tap point is not dependent upon a constant current as is described only in Applicant's claim 15.

For purposes of the discussion that follows below, the voltage at the junction of resistor R21 and resistor R24 is designated as voltage V1, the voltage at the junction of resistor R22 and R21 is designated as voltage V2, the current through resistor R21 is designated as current I21, and the current through resistor R24 is designated as I24. Switching regulator 10 is arranged to provide a DC voltage output (i.e. V2) where a charging current is delivered to the battery (BATT) through resistor R21 and diode D1.

The voltage across resistor R21 is determined by the amount of charging current being delivered to the battery, and the voltage of the battery itself. When the battery is fully charged, there will be no charging current delivered to the battery and voltage V1 will be exactly the same as voltage V2. In other words, when the battery is fully charged current does not flow through resistor R21. When the battery is not fully charged, the current flowing through resistor R21 is determined as: I21 = (V2 – V1) / R21. This relationship is depicted in FIG. 3 of *Lee*, which is also illustrated below:



OP21 is an operational amplifier (see col. 7, lines 33-35). It is notoriously old and well known in the art that operational amplifiers are voltage amplification devices that have very high input impedances so that they drain no current, and that they amplify input voltages according to the notoriously old and well known relationship: Va = Av*(VP – VM), where Av is referred to as the open loop gain, VP is the voltage at the non-inverting terminal, VM is the voltage at the inverting input terminal, and Va is the output voltage of the amplifier. It is most important to note that the operational amplifier will attempt to source and sink as much current as possible until the voltages VP and VM are identical. In other words Va = 0 when VP = VM.

Referring to resistor R24, notice that the output of the operational amplifier is coupled to resistor R24 through resistor R25. Since the operational amplifier has a nearly infinite input impedance, as is notoriously old and well known in the art, all of the current from the output of the operational amplifier flows through resistor R24. In other words, Ohm's law will dictate that the current in resistor R24 is given as: I24 = (V1 – Va) / (R24 + R25). The only way that operational amplifier OP21 will provide a constant current with resistor R24 is when the voltages V1 and V2 have constant and unchanging values. Since the entire purpose of the *Lee* invention is to provide a battery charger, the voltage V1 cannot remain constant unless the battery is already fully charged, which would completely eliminate the need for circuit 20 in *Lee*.

The circuit (20) described in Lee and depicted above is an amplifier circuit. A simple and routine circuit analysis will yield the following mathematical relationship between the values of resistors R21 – R25, the voltages V1 and V2, and the output voltage (Va) of operational amplifier OP21 are derived as follows below using superposition.

Setting V2 = 0V, and solving for Va as Va1:

Since VP = 0V when V2 = 0V, and VM = VP = 0V

I24 = (V1 – VM)/R24 = V1/R24

I25 = (VM - Va1)/R25 = -Va1/R25

Since I24 = I25, V1/R24 = -Va1/R25, and

Va1 = -V1 * (R25/R24)

Setting V1 = 0, and solving for Va as Va2:

DIV = R23/(R22 + R23) = 1/(1 + [R21/R22])

VP = V2*DIV = V2/(1 + [R21/R22])

VP = VM

I24 = (0V – VM)/R24 = -VM/R24 = -VP/R24

I25 = (VM – Va2)/R25 = (VP – Va2)/R25

Since I24 = I25, -VP/R24 = (VP – Va2)/R25, and

Va2 = VP*(1 + [R25/R24]) = V2*DIV*(1+[R25/R24])

Va = Va1 + Va2

Va = V2*DIV*(1+[R25/R24]) – V1*(R25/R24)

For simplicity let us assume that R22 = R24, and R23 = R25. This configuration is a notoriously well known differential amplifier configuration where:

Va1 = -V1 * (R25/R24),

Va2 = V2 * (1 + [R25/R24]) / (1 + [R24/R25]) = V2*(R25/R24)

and Va = (V2 – V1)*(R25/R24)

As described previously above, there is no difference between voltages V1 and V2 when the battery is fully charged, and hence there would be no current flowing though resistor R21 nor through resistor R24 according to the above relationships. When the difference between voltages V1 and V2 increases, the operational amplifier (OP21) will source or sink additional current through resistor R24 according to the output voltage Va. Since the operational amplifier is operating as an amplification circuit, the current in resistor R24 is not a constant. Moreover, it is simple to notice that the tap point voltage between resistors R22 and R23 is identified as voltage VP, which is independent of the current in resistor R24.

For at least the reasons stated above, it is believed that the *Lee* reference fails to teach all of the claim limitations that are recited in Applicant's claim 15. It is respectfully submitted that claim 15 is allowable and notice to that effect is requested. Since claims 16 and 18 – 20 depend upon and further limit claim 15, it is believed that those claims should be allowable for that reason as well as any other limitations they recite.

CONCLUSION

In view of the foregoing amendment and remarks, all pending claims are believed to be allowable for at least the reasons stated above and the application is in condition for allowance. Therefore, a Notice of Allowance is respectfully requested. Should the Examiner have any further issues regarding this application, the Examiner is requested to contact the undersigned attorney for Applicants at the telephone number provided below.

Respectfully submitted,

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